LEVEL II SOFTWARE REUSE STUDY

Scott E. Herman
Grumman Program Support Contract

The Space Station Freedom Program (SSFP) Level II Software Reuse Study group was formed by Bob Nelson (NASA SSFP office) from members of the Information Systems Program Support Contract (PSC) team. The objectives of the study were to identify existing software reuse libraries, to identify existing reusability processes and experiences, to identify reusability analysis tools and users, and to provide recommendations for a software reusability process for the SSFP. To date the following have been delivered (1) definitions of commonality and reuse, (2) a report on existing software reuse libraries and library management systems, (3) a report on reuse process and methodology gleaned from software reuse experts, and (4) a report on software attributes for measuring commonality and reusability. Three implementation alternatives for a repository of reusable components were identified: centralized at the SSE Development Facility (SSEDF), a distributed approach across the network of Software Production Facilities, and a directory approach. A number of findings from the reuse study and several reuse strategy considerations were presented.

Study Objectives

Study group was formed by Bob Nelson at SSFP Level II from members of Information Systems Program Support Contract (PSC) team including Jim Flynn, Glenn Boyce, Scott Herman and Tammy Smith to:

1. **Identify existing software reuse libraries**
2. **Identify existing reusability processes and experiences**
3. **Identify reusability analysis tools and users**
4. **Provide recommendations for a software reusability process for the SSFP.**

Accomplishments to Date

Deliverables

1. **Definitions of Commonality and Reuse**
2. **Report on existing software reuse libraries and library management systems**
3. **Report on reuse process and methodology from the software reuse teleconference**
4. **Report on software attributes for measuring commonality and reusability**

Report on Reuse Libraries and Tools

* Provides a list of software libraries and library management systems

* Report includes for each system:

- Point of Contact
- Users
- Acquisition Requirements
- Description
- Processes and Methodology

Reusable Library and Library Management Systems Investigated

Reusable S/W Name	Library	Library Management Systems
*RSL (Intermetrics)	●	●
*RAPID	@	●
RSL (Ford)	●	●
GRACE	●	
COSMIC	●	
CAMP/AMPEE	●	●
TTCQF	●	@
SPC	●	@
JSC Ada S/W Library	●	

@ - Denotes Plans

* - Identifies Ruben Prieto - Diaz/ Peter Freeman Classification Approach Implementations

Report on Reuse Processes and Methodology From the Software Reuse Teleconference

* Need an overall model of the SSFP software development process.
* Domain analysis is very important.
* Identified need for a classification system using a controlled vocabulary to classify products.
* Good user interface to a software product library is very important.
* Must define incentives for contractors to build and use library products.

Report on Software Attributes for Measuring Commonality and Reusability

* Provides a general discussion of software classification for reuse
* Discusses domain-sensitive attributes
* Presents a perspective on High-level vs. Low-level attributes
* Recommends a specific set of classification Attributes
* Recommends attributes of information to be included in source code prologues

Reuse Study Attribute Sources:

1. **Booch Components**
2. **CAMP**
3. **Intermetrics**
4. **RAPID (Reusable Ada Packages For Information System Development)**
5. **Ruben Prieto - Diaz (Faceted Classification Scheme)**

Repository Implementation Alternatives

- **Location Of Actual Software Products**
- **Three Potential Schemes**

1). **Centralized At SSEDF -**

All Life-cycle Products Delivered To And Maintained At The SSEDF.

2). **Distributed Approach -**

SSE System Manages And Maintains Life-cycle Products Throughout The Network (Physical Location Transparent To The Users).

3). **Directory Approach -**

Developer Updates Library Mgmt System With Physical Location Of Life-cycle Product.

Findings:

1. Life cycle products from all phases of the software development process should be included in the reuse library.

2. Software development products of the SSFP should be included in a reuse library.

3. Access should be provided to all reusable life cycle products and notification should be given to users when new or updated products are added to the reuse library.

4. Reuse should be considered during each phase of the life cycle and an analysis of existing library products should be performed prior to initiating a new phase of the life cycle or a new project.

5. A standard taxonomy should be used to describe attributes of software life cycle products from each phase of the life cycle.

6. The use of a library management and classification system which incorporates the Faceted Classification scheme will meet the search/storage/retrieval requirements for software product reuse

Findings (conc)

7. Domain analysis should be performed at each stage of the life cycle to identify attributes of the required product and to use these attributes to identify common or reusable candidates.

8. A controlled attribute vocabulary for each phase of the life cycle will need to be established to facilitate domain analysis.

9. Maintenance responsibilities should reside with the developer or modifier. Reusers should be tracked and notified of errors and anomalies in usage of library components.

Reuse Strategy Considerations

1. Define a standard attribute vocabulary (similar to the one done by the U.S. Army) for use in describing software life cycle products. Such a vocabulary would facilitate Domain and Commonality analysis.

2. Continue the study to identify attributes for software life cycle products; to date, only the attributes for source code have been defined.

3. Create incentives for software developers: both for expending the extra effort to develop reusable products and for saving time and effort by using existing reusable products from the library.